THE GENUS LINDSAYA IN THE MALAY PENINSULA.

With Descriptions of Two New Species.

By R. E. Holttum.

The genus Lindsaya as here arranged is represented in the Malay Peninsula by 18 species, two of which are now described as new. A few of them, especially those confined to the mountains, are not yet adequately known, and it is possible that further study in the field will reveal a few more distinct species. In this genus it is not infrequent for plants immature as regards size to bear fertile pinnae; thus, in many species simply pinnate fronds on young plants may be fertile, while more mature plants may bear bipinnate fromds, the leaflets in the two cases being sometimes rather different. It is therefore important, in all cases, to have ample material, in order that the full range of habit of a species may be known. Observation in the field is also essential; most species have a quite definite habitat, especially those which grow by the sides of streams and rivers.

The Lindsayas of the Peninsula have hitherto been very conservatively treated, especially the species allied to *L. decomposita*. In the past, only two species of this affinity have been recognised, *L. decomposita* and *L. davallioides*. It is clear however from examination of copious material that several species may be distinguished, two of them with veins usually free (thus breaking down the distinction of the subgenus *Synaphlebium*). The species *L. decomposita* has been credited with a distribution throughout tropical Asia, Australia, and Polynesia; I think it highly probable however that no one type persists throughout this range, and that further study will show that many local species exist, such as those here recognised. This raises the question of what constitutes a species. It is clear that among ferns all species have not the same status; some are much more comprehensive than others. The tendency is to divide the species more minutely as more material is available for study, and in many groups such subdivision rests on a basis of genuine natural distinction. In other groups, at least in the Malay Peninsula, a clear distinction does not seem possible, even with ample material; an example of this is the group of *Dryopteris crassifolia*. In such cases more intensive field study will doubtless give more information, but I am doubtful whether a final distinction will always be possible by methods of observation alone. It is at least certain that in such groups the description of new species based on isolated herbarium specimens is quite useless.

The species allied to *L. decomposita* seem to be on the whole sufficiently distinct, except for the mountain plant

L. subalpina. The other large group of species within the genus, that of *L. scandens, L. pectinata* and *L. repens* is much less clearly resolvable, and I am by no means satisfied with the present arrangement, especially as regards *L. pectinata.*

In the discrimination of closely allied species in this genus, the rhizome scales, which in other genera are often very characteristic, afford little assistance. These scales are of a very uniform nature throughout the genus, differing chiefly in size, in relative width and in depth of colour; the scales of *L. plumula* and *L. scandens,* for example, are quite different, but between closely allied species no distinction can be found.

The Lindsayas are nearly all plants of the full shade of mature forest. The only exceptions to this in the Peninsula are the clearly xerophytic montane species *L. rigida, L. plumula,* and probably the plant here named *L. cultrata* var. *parvula.* No lowland species grow in open sunny places, and all except the climbing forms of *L. scandens* are terrestrial. The following grow beside shady river banks, and appear rarely to be found elsewhere: *L. Lobbiana, L. orbiculata, L. integra.*

I am indebted to the Director of the Botanic Gardens, Buitenzorg, for the loan of numerous specimens from the Buitenzorg herbarium, including the types of several species.

The following key is not altogether satisfactory, as in many cases the distinctions between species, though clear enough to the eye, are not easy to summarise in a short sentence. I believe however that it will serve in most cases, though it may not cover every individual plant.

- **A** veins free
  - **B** fronds once pinnate
    - **C** largest pinnae less than 1 cm. long
      - **D** pinnae fan-shaped, sorus continuous along outer edge *L. orbiculata*
      - **D** pinnae longer then broad, usually lobed
        - **E** pinnae to 4 by 7 mm., horizontal *L. cultrata v. parvula*
        - **E** pinnae to 3 by 9 mm., oblique *L. plumula*
    - **C** pinnae usually about 1 cm. long
      - **F** rhizome short-creeping *L. Lobbiana*
      - **F** rhizome long-creeping or climbing
        - **G** pinnae broad, decurved, sori continuous, bipinnate fronds on mature plants *L. scandens*
        - **G** pinnae not decurved, to 15 mm. long, sori separate or more or less united, no bipinnate fronds *L. pectinata*

- G pinnae straight, slightly tapering, to 2.5 cm. long, upper edge lobed *L. repens*
- B fronds bipinnate
  - H rhizome long-creeping
    - I pinnules to about 5 by 8 mm., coriaceous, lobed *L. rigida*
    - I pinnules to about 7 by 15 mm., thin, entire *L. scandens*
  - H rhizome short-creeping
    - K pinnules entire
      - L pinnules to about 7 by 15 mm., *L. scandens*
      - L pinnules about 5 mm. long, pinnae numerous *L. borneensis*
      - L pinnules fan-shaped, sorus continuous along outer edge, pinnae few
        - M the terminal pinnules joined to form a large lobed triangular leaflet *L. tenera v. gigantea*
        - M the terminal pinnules no so joined *L. orbiculata*
    - K pinnules more or less lobed, with several sori
      - N pinnules much longer than broad
        - O pinnules close, horizontal, to 4 mm. wide *L. napaea*
        - O pinnules to 6 mm. wide at base, oblique, lobed to 1 mm. deep *L. malayensis*
      - N pinnules hardly longer then broad *L. tenera*
- A veins anastomosing
  - P pinnules entire or slightly lobed
    - Q fronds usually pinnate
      - R pinnae ascending, to about 5 by 12 mm. *L. integra*
      - R pinnae decurved, to about 6 by 22 mm. *L. recurvata*
    - Q fronds usually bipinnate *L. decomposita*
  - P pinnules distinctly lobed
    - S lobes half way to lower edge *L. parallelogramma*
    - S lobes less than half way to lower edge
      - T leaflets to about 4 by 12 mm. *L. davallioides*
      - T leaflets larger
        - U leaflets acute, sorus continuous round tip *L. recurvata*
        - U leaflets not acute *L. subalpina*

Mr. H. N. Ridley's paper, "The Ferns of the Malay Peninsula," published in the Journal of the Malayan Branch, Royal Asiatic Society, Vol. 4, pp. 1—121, is here referred to as Ridley (1926).

L. Lobbiana Hook., Spec. Fil. 1, p. 205, tab. 62 C.

L. propria v. A. v. R., Bull. Jard. Bot. Buitenzorg, Ser. 2, XVI, p. 20.

The type of this species came from Java, and in my opinion *L. propria* (of which I have examined authenticated specimens) is quite identical with it. The common Peninsula fern usually referred to it has usually paler stipes, smaller fronds, and pinnae on the whole more broadly truncate at the apex, than the plants from Java, but the distinctions are small and by no means constant. In the Peninsula it is a low country plant, and usually found beside streams. The specimens in the Singapore herbarium are very uniform, except that Md Nur's no. 12008 from Sungei Ketil (Keteh), Kelantan, has long fronds (to 45 cm., including stipe) and some quite entire pinnae with narrowly rounded apices. Christensen has a note on this species in this Bulletin, vol. 4, p. 396.

L. cultrata (Willd.) Sw. var. **parvula**, var. nov.

Differs from typical *L. cultrata* in its smaller size (stipes to 4 cm. long, fronds to 10 cm. long and 1.6 cm. broad), thicker texture, and dark brown colour of stipes. Specimens in the Singapore herbarium are as follows: Type: Sumatra, Sibolangit, Md Nur 7297; also two unlocated and unnumbered specimens from the Malay Peninsula, collected by Scortechini.

These specimens agree closely together in their small stature and coriaceous texture. In habit of growth and shape of fronds and of pinnae they agree closely, on a small scale, with *L. cultrata*, a species which in its typical form has never been found in the Malay Peninsula.* It is possible that these specimens are depauperate owing to exposed situations of growth, but of this there is no evidence. I hesitate under the circumstances to assign them to a distinct species, but their uniform appearance makes them worthy of notice, and I therefore refer them provisionally to a variety of the wide-ranging *L. cultrata*. This species appears to be very constant throughout its range; in the Singapore herbarium are specimens from Ceylon, S. India, Assam and Java, all agreeing closely together. I have seen it growing in Java, both on Mt. Gedeh in West Java and on the Tengger Mountains in East Java; in both cases it grew on moist banks in rather exposed situations at about 5,000 ft. or more above sea. Its texture is firm, and in this it differs markedly from the majority of Peninsula species, which are shade plants with thin leaflets. A Ceylon specimen (coll. Bishop Hose) is labelled "sides of brooks in the hills." The next species, which is also closely related, grows beside a mountain stream in rather exposed situations.

L. cultrata. Since the above was printed I have found typical plants of this species on mossy rocks by Robinson's Fulls, Cameron's Highlands, at an altitude of about 4500 ft. (No. 23463).

L. plumula Ridley, Journ. Mal. Br. R. Asiatic Soc., IV, 22 (1926).

This species is known only from Gunong Tahan, at an altitude of about 5,000 ft., and has been found there by all collectors visiting the mountain. I found it growing in a thick close crust of bryophytes on rocks in the bed of the Teku river, where the stream is bordered on both sides by low forest. It grows well above normal water level and is fully exposed to the midday sun, so that its small tough pinnae are a xerophytic adaptation. The smallest fertile fronds are about the size of *L. bullata* v. A. v. R. from Java, but I think they are distinct. The largest fronds however approach very closely to *L. cultrata*, and I am not sure that a distinction can be maintained. The largest frond of *L. plumula* in the Singapore herbarium is 25 cm. long (inclusive of stipe) and 1 cm. wide, the largest pinna measuring 9 by 3 mm. The specimens are as follows (all from Gunong Tahan at about 5,000 ft.) : Wray & Robinson 5521, Ridley 15997, Haniff & Nur 7956, Holttum 20672.

L. scandens Hk., Spec. Fil., I, 205, t. LXIII B.

There is a note on this species in this Bulletin, Vol. 4, p. 64. It is there assumed that *L. lancea* (originally described from Surinam) occurs throughout the tropics. I cannot attempt to decide whether the Asiatic ferns assigned to it are really to be regarded as of the same species as those from the New World; but I am still of the opinion that the terrestrial Malayan ferns hitherto regarded as *L. lancea* are not specifically distinct from the scandent ones which have been called *L. scandens*. It is therefore most convenient at present to retain the name *L. scandens* for all the Malayan ferns concerned.

This is probably the most abundant species in the genus, taking the Peninsula as a whole. It occurs in the lowlands, and on mountains to about 3,000 ft., in moist forest, terrestrial or climbing on trees or rocks; never in exposed places. When terrestrial, the leaflets of young plants are larger, and bipinnate fronds are the rule. When scandent, the fronds are more frequently simply pinnate, and the leaflets on the whole somewhat smaller. It is impossible however to distinguish bipinnate fronds of mature well-grown plants, whether terrestrial or scandent. It is hardly necessary to enumerate the many specimens of this species which have been collected in the Peninsula. I will confine myself to listing those which I think should come under the next two species, which are closely allied to *L. scandens*.

L. pectinata Bl., Enum. Pl. Jav., 217.

This species has never been figured. I have seen several specimens from Java, which agree well with descriptions, and among themselves. The specimens from the

Peninsula differ from them chiefly in the much darker rhizome and scales, and also in a greater tendency to fusion of the sori. I think however that they may be regarded as conspecific. The specimen from the Peninsula which is nearest to the Javanese ferns is Henderson's no. 11258 from Fraser's Hill. This has simply pinnate fronds to 40 cm. long and 3 cm. wide; the pinnae to about 16 by 8 mm., of thin texture, drying very dark and slightly wrinkled, their lower edges nearly straight and slightly oblique upwards (decurved a little in the lowest pinnae only), the upper edge either lobed slightly throughout or more usually towards the tip only, the lower sori being all joined together (see fig. 4). Other specimens have the sori all joined as in *L. scandens*, though in other respects they agree with the one described. In still others (chiefly immature plants) the pinnae are decurved as in *L. scandens* but with sepatate sori (*e.g.*, Burkill & Holttum 8452 from Fraser's Hill) ; these approximate to *L. oblanceolata* v. A. v. R., the type of which I have seen; I would consider it immature, and probably a form of *L. pectinata.* Other specimens approach *L. scandens* so closely that the line of distinction is very hard to draw. It appears that *L. pectinata*, as here considered, is a mountain species, and simply pinnate (though bipinnate forms are known in Java), as distinct from the lowland *L. scandens*, which has typically bipinnate fronds on mature plants. There is however a lowland specimen from Johore which agrees rather with *L. pectinata* than with *L. scandens.* More field study of *L. pectinata* is required before it can be properly understood. It may perhaps be only a mountain form of *L. scandens.* The following is a list of specimens provisionally referred to it. There are also a few unlocated specimens, probably from Perak.

JOHORE: Ulu Kahang, 400 ft., Holttum s.n. (May 1923).

PAHANG: G. Tahan, Ridley 15995; Kluang Terbang, Barnes s.n. (1900) ; Fraser's Hill, 4,000 ft., Henderson 11258 (F.M.S. Mus. Herb.), Holttum 11369 and s.n. (13.8.23), Burkill & Holttum 8452, E. Smith 839.

PERAK: G. Hijau, 4700 ft., Burkill 12664, Fox s.n. Oct. 1899) ; Cottage, Taiping Hills, H. D. Hervey s.n. (1889) ; Bujang Malacca, Ridley 9603.

L. repens (Bory) Bedd., F.S. I., t.209.

There are certain specimens, chiefly from Perak, which agree well with this species as described and figured by Beddome. They differ from those referred to *L. pectinata* by their longer pinnae (to 2.5 cm.) their sori always separate, and the upper edges of the pinnae regularly lobed. Immature plants from Maxwell's Hill have their younger fronds with pinnae lobed almost to the lower edge, as in *L. hymenophylloides* Bl. Typical specimens of *L. repens* are as follows:

PERAK: Taiping Hill, Burkill 12835; Bishop Hose s.n. (Aug. 1884, Herb. Hullett); Maxwell's Hill 4500 ft., Fox 115; Maxwell's Hill 3000 ft., Scortechini s.n. (March 1884).

PAHANG: Telom, Ridley s.n. (Nov. 1908).

Ridley's 8666 from 15th mile Pahang Track has separate sori, but the upper edge only slightly lobed; it is midway between typical *L. repens* and *L. scandens*, and might perhaps be referred to the latter. Finally, there is a specimen from Bukit Timah, Singapore (collected by Ridley in 1893) which agrees quite well with *L. repens*, except that it is small (the largest pinna in 1.6 cm. long). Possibly it is only an abnormal juvenile form of *L. scandens*. It is clear that the group of species *L. repens*, *L. scandens* and *L. pectinata* is a very close one, and further work on their relationships is necessary.

L. orbiculata (Lam.) Mett.

Christensen has a note on this species in this Bulletin, Vol. 4, pl 397. Taking the species in his sense, the following specimens are clearly referable to it. They are easily distinguished by the characters he mentions. Like *L. Lobbiana*, this is usually a riverside species, though not exclusively so. The localities from which specimens have been collected are comparatively few, and it is curious that none are from Perak.

SINGAPORE: Changi, Ridley 13341; Pulau Brani, Hullett s.n. These Singapore specimens are large (to 45 cm. long) and frequently bipinnate.

PAHANG: Bentong, Sungei Perting, Burkill 16574; Tahan River, on rocks, Ridley 2151, Holttum 10547, Seimund 479 (Herb. F.M.S. Mus.).

PENANG: Government Hill, on bank by roadside, Holttum 9079; above waterfall, Holttum 10287; Ridley 9226; Richmond Pool, Fox 10666.

KEDAH: Kedah Peak, Ridley s.n. (June 1893); Bukit Wang, Haniff 1203.

L. tenera Dry.

Next to *L. scandens*, this is probably the most abundant species in the Peninsula. It is found as a terrestrial fern on hillsides in high forest throughout the Peninsula, from about 1000 to 4000 ft. above sea level, and occasionally at lower altitudes. It has not been found in Johore or Singapore. It is very uniform, and at least in the Peninsula very sharply distinct from *L. orbiculata*, so that it should clearly be separated as a distinct species. There is no need to enumerate the large number of specimens.

Beddome's figure (F.S.I., tab. 24) gives an adequate idea of the species, though the pinnules are often more deeply lobed than is there shown.

L. tenera v. **gigantea** (Hk.) Spec. Fil., I, 211, t.LXIII. C.

At a few places ferns have been found agreeing fairly well with this figure of Hooker's, but they are smaller, and the terminal undivided part of the lamina larger in proportion. Whether they should properly be reckoned a variety of *L. tenera* I am not certain. At least they are much nearer to that species than to the true *L. orbiculata.* The specimens in question are all from mountain forests; they are:

PENANG: Government Hill, Hullett s.n. (Dec. 1881); Richmond Pool, C. G. Matthew s.n. (Dec. 1906).

PERAK: Maxwell's Hill, 3900 ft., Burkill 13213.

PAHANG: Fraser's Hill, 4,000 ft., Burkill & Holttum 8762, E. Smith 826.

L. rigida J. Sm., Hooker, Spec. Fil. I, t.63A.

The type of this species is Cuming's 397 from Malacca (presumably Mt. Ophir). I have seen no specimens from outside the Malay Peninsula, though van Alderwerelt van Rosenburg gives the distribution as including Celebes, New Guinea and the Philippines. *L. triplosora* v. A. v. R. from Sumatra is closely allied. *L. rigida* is the only Peninsula species with a long creeping slender wiry rhizome. It is exclusively montane, occurring in comparatively exposed places, either creeping among bryophytes along the ground or on tree trunks. Its pinnules are very rigid, and appear adapted to its habitat. The specimens in the Singapore herbarium are from Mt. Ophir, Gunong Tahan, the Taiping Hills, and the Main Range at G. Inas, G. Batu Puteh, G. Bubu and G. Bujang Malacca.

L. borneensis Hk., Syn. Fil. 107.

This species has been found in comparatively few localities in the Peninsula. It is a very beautiful fern, dark green, often with a metallic iridescence. I have seen it alive only in the moist shady forest on the ridge of G. Panti in Johore. Though superficially similar to *L. rigida,* it is quite different in habit and also in habitat, and the very numerous smoothly rounded almost imbricating pinnules are very distinctive. Young plants often bear simply pinnate fronds. I have seen the following specimens:

SINGAPORE: Kranji, Ridley 14186; Sungei Buloh, J. S. Goodenough s.n.

JOHORE: G. Panti, 1500 ft., Holttum 15044.

SELANGOR: Kanching woods, Ridley s.n. (Dec. 1920; in Kew Herbarium as *L. rigida*).

PAHANG: Tahan River, Ridley (fide Ridley, not seen).

The following specimens cited by Ridley (1926, p. 23) under *L. rigida* are *L. scandens*:

SINGAPORE: Sungei Jurong, Ridley 12132.

PERAK: Taiping Hills, Ridley 3962.

L. napaea v. A. v. R., Bull. Jard. Bot. Buitenzorg, Ser. 2, XX, p. 19, t. III.

This species is clearly allied to *L. decomposita,* which it resembles in habit, but it has always free veins, and narrow pinnules very closely placed. It is one of the most clearly defined of what is evidently a group of species of the *L. decomposita* alliance. It was originally described from Lingga, but is found throughout the Peninsula as far north as Kedah, and is very uniform throughout. It is terrestrial, and occurs in forest on hillsides in the same situations as *L. tenera,* usually from about 1000 ft. upwards. The following specimens are in the Singapore herbarium:

MALACCA: Mt Ophir, Ridley 3351.

NEGRI SEMBILAN: G. Angsi, Ridley s.n. (Feb. 1904).

PAHANG: Fraser's Hill, 4000 ft., Henderson 11272 (Herb. F.M.S. Mus.), E. Smith 852, Burkill & Holttum 8466, Holttum 10520; G. Tahan 3000 ft., Holttum 20933.

KELANTAN: foot of G. Sitong, Md Nur 12177.

PERAK: G. Batu Puteh, 3000-4000 ft. Kunstler 8044.

PENANG: Government Hill, 2,400 ft., Fox 58.

KEDAH: Kedah Peak, Ridley s.n. (June 1893).

L. decomposita Willd.

Here I place a few specimens which agree closely among themselves, though I am not certain that they are identical with this species. They are rather sparingly bipinnate. A pinnule of the Bukit Timah plant is figured. They appear to be terrestrial ferns of lowland forest. One or two of the specimens approach *L. recurvata,* though the larger ones are quite distinct; further field investigation of the two species is necessary. The specimens are:

SINGAPORE: Bukit Timah, Ridley s.n. (1894).

JOHORE: G. Panti 1600 ft., Holttum 18099; G. Lambak 1500 ft., Holttum 9383.

NEGRI SEMBILAN: G. Tampin 1800 ft., Holttum 9606.

L. recurvata Wall. Hook., Spec. Fil. I, p. 222, tab.LXX A.

L. trapezoidea Copeland, Univ. Cal. Publ. Bot., 14, no. 17, p. 376, pl. 61 (1929).

Hooker's figure gives a good idea of this species; there is however considerable variation in the shape of the pinnae, and some plants show a tendency to a bipinnate condition, though this is not usually marked. The sterile pinnae are usually more or less incised along the upper edge. The pinnae of fertile fronds may be almost entire, as indicated in Hooker's figure, and either rounded or decidedly acute at the apex, or they may be distinctly lobed, all conditions sometimes being found on pinnae of the same frond. Copeland's *L. trapezoidea* from Sumatra is identical with some of the Peninsula specimens referred here.

This appears to be a lowland forest fern, and has been found chiefly in the south of the Peninsula, though two Penang specimens are quite similar, and it is likely that more collecting will reveal a wider distribution. The type is apparently a specimen of Wallich's from Singapore. There is one mountain specimen from Fraser's Hill, which has two large lateral branches and some pinnules unusually lobed, but otherwise is typical. Specimens referred to this species are:

SINGAPORE: Bukit Timah, Ridley 9561.

MALACCA: Cuming 392; Hervey s.n. (1889); S. Udang Reserve, Derry 85.

NEGRI SEMBILAN: Senaling-Inas F.R., Holttum 9748; G. Tampin, Holttum 9611.

SELANGOR: Rantau Panjang F. R., Hume 7630 (Herb. F.M.S. Mus.).

PAHANG: near Fraser's Hill, 3700 ft., Holttum s.n. (14.9.23).

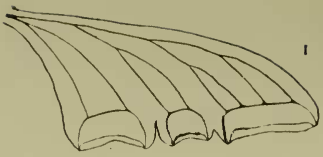
PENANG: Ridley s.n.; Western Hill, Haniff 9120.

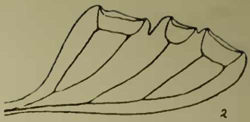
In the Buitenzorg Herbarium is also the following:

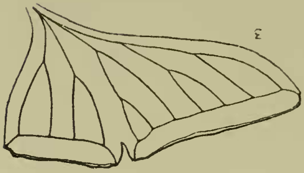
P. LINGGA, G. Daik, Bünnemayer 6734 a. Copeland's *L. trapezoidea* extends the distribution of the species also to Sumatra.

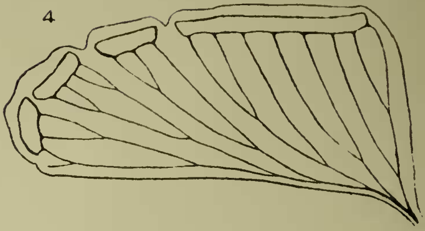
L. integra, sp. nov.; habitus L. Lobbianae, ab illa pinnis integris apicem versus leviter angustatis, venis anastomosantibus, frondibus interdum ramosis, differt.

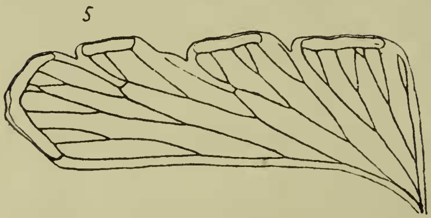
Rhizome short-creeping, the younger parts covered with small narrow scales. Stipes 5 mm. apart, 3–12 cm. long, four-angled in their upper part, pale or occasionally brown in the largest fronds. Fronds usually once pinnate, 7–20 cm. long, to 2.5 cm. wide. Pinnae glabrous, almost touching, more distant and somewhat reduced at the base, and smaller towards the apex of the frond, sessile, 8–15 mm. long, 3–5 mm. broad, the lower edge straight, ascending, the base rather narrowly cuneate, the upper side usually entire, the apex broadly rounded; texture chartaceous, drying rather pale green. Veins anastomosing irregularly, visible on both surfaces, but not prominent. Sori continuous (occasionally interrupted) from upper

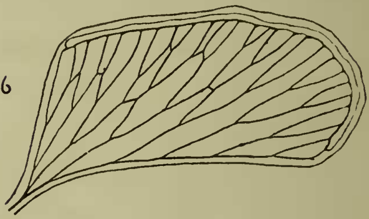


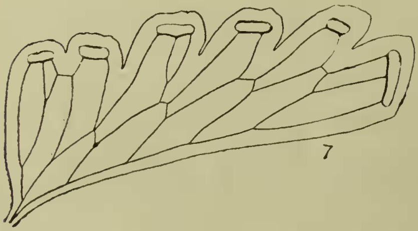


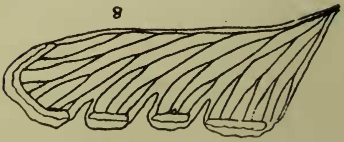


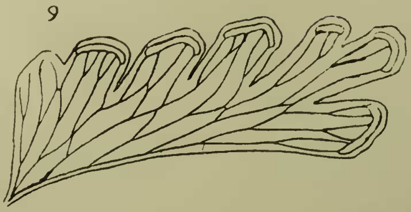












Figs. 1 and 2. L. plumula.
Fig. 3. L. cultrata var. parvula.
Fig. 4. L. pectinata (Fraser's Hill, Henderson 11258).
Fig. 5. L. decomposita (Bukit Timah Ridley).
Fig. 6. L. integra (Tahan River, Holttum 20934).
Fig. 7. L. davallioides (Sungei Jeriau, Holttum 21580).
Fif. 8. L. malayensis (G. Kerbau, Haniff 4032).
Fig. 9. L. parallelogramma (Sungei Pelepah, Md Nur 20035).
All magnified about four times.

base round apex of pinnae. Indusium firm, usually rather narrow. Some fronds bear one or two small lateral branches.

TYPE: Tahan River, Holttum 20934, on rocks by river bank.

This appears to be an exclusively riverside species. It has the habit of *L. Lobbiana*, but the pinnae are nearly always quite entire, and the veins anastomose irregularly. Its relationship is apparently with *L. recurvata*. Other specimens are:

PAHANG: Tahan River, Ridley s.n. (1891); K. Teku, Seimund 422, 595 (Herb. F.M.S. Mus.).

PERAK: Upper Perak, on rocks in river, 300 ft., Wray 3674; Bujang Malacca, Ridley 9605.

SELANGOR: Rawang, Ridley s.n. (May 1896).

In the Buitenzorg Herbarium is a specimen from Sumatra (Solo tabeantoe, Dr. Burck, 1893).

L. davallioides Bl., Enum. Pl. Jav. 218.

I have examined a number of specimens of this from Java, where it appears to be a very uniform species. It has thin translucent pinnules and the venation rather open, though regularly anastomosing. It would appear to grow in very moist places, and Raciborski says of it " an den schattigsten stellen (in der Gesellschaft der grossen Trichomanes-arten und *Treubia insignis*) wachsend." The Peninsula specimens which approach it most nearly are some small plants found growing abundantly by streamsides below Fraser's Hill, on both sides of the Main Range (in the Tras valley, 3800 ft., Holttum 11492; by the Sungei Jeriau, 3500 ft. Holttum 21580). None of the plants from these collections had fronds with more than one pair of lateral branches, and many of them (already fertile) were simply pinnate. I consider however that in spite of their small size they should be referred to *L. davallioides*. The only other specimens referable here are the following; they have rather larger leaflets, thicker in texture, than the Java plants.

PERAK: Larut Range, 4000 ft., Scortechini 230:437a.

JOHORE: G. Pulai, Ridley 12131.

L. malayensis, sp. nov.; ab L. davallioide venis raro anastomosantibus, pinnulis majoribus, ramis paucioribus differt.

Rhizome short creeping; stipes approximate, glabrous, pale. four angled above, to 25 cm. long. Fronds bipinnate, with one or two pairs of pinnae standing at about an angle of 45° to the rachis (on young plants simply pinnate fronds may bear sori). Lateral pinnae to 17 cm. long and 2.5 cm. wide; terminal pinna to 20 cm. long and 3 cm. wide, narrowed gradually to apex. Leaflets glabrous, thinly chartaceous, horizontal, or slightly ascending, 12 to 15 mm. long, 5–6 mm. wide near base, narrowed slightly towards apex; lower edge straight, slightly upcurved towards the apex; upper edge lobed with 4 to 6 lobes; lobes oblique, about 1 mm. deep; apex rounded. Smaller pinnules with upper edge entire. Veins free or occasionally anastomosing, prominent on the upper surface when dry, visible but not prominent on the lower surface. Sori in the lobes, usually uniting the apices of several veins; indusia firm, rather narrow, the edge undulate.

PERAK: G. Kerbau, 4500 ft., Haniff 4032 (type); Maxwell's Hill 3000 ft., Wray 115.

PAHANG: G. Berumban, Ridley 13945; Cameron's Highlands, 4500 ft., Henderson 11970; Fraser's Hill, 4000 ft., Burkill and Holttum 8707, Holttum s.n. (15.9.23, immature).

This species is clearly allied to *L. davallioides*, but appears to be less hygrophytic in character, and the veins are usually free. As with other mountain speices, further field study is needed.

L. parallelogramma v. A. v. R., Bull. Jard. Bot. Buitenzorg, Ser. 3, Vol. 5, p. 212 (1922).

This bipinnate species allied to *L. davallioides* was originally described from the Lingga archipelago. By comparison of Peninsula specimens with the type it appears that *L. parallelogramma* is a very constant species, and that it occurs as a terrestrial fern in lowland forest in many parts of the Malay Peninsula. The pinnules are more deeply lobed than in any other species of this group, and are of very regular shape; the uniform width and the broad but deeply cleft distal ends of the pinnules are characteristic. Both pinnules and lateral branches are nearly at right angles to the main rachis. The specimens in the Singapore herbarium are:

SINGAPORE: Bukit Timah, Ridley 9562, and s.n. (1890); Hullett s.n. (March 1882).

JOHORE: Sungei Pelepah, Md Nur 20035 (figured); G. Berhidong 1500 ft. Holttum 10957.

MALACCA: Lower woods of Mt Ophir, Ridley 3348.

NEGRI SEMBILAN: Bukit Tangga, Md Nur 11820; G. Angsi, Holttum s.n. (2.12.22).

PAHANG: Sungei Teku, Seimund 231 (Herb. F.M.S. Mus.); Sungei Tahan Ridley 2179.

TRENGGANU: Bundi, Rostados s.n. (Feb. 1904).

PENANG: Government Hill, Hullett s.n. (Dec. 1881); Ridley s.n. (Dec. 1895).

In the Buitenzorg herbarium is also the following:

SUMATRA: Djambi, 160 m., Posthumus 600.

L. subalpina v. A. v. R., Bull. Jard. Bot. Buitenzorg, Ser. 2, XXIII, 15 (1916).

This species is a relatively large simply pinnate fern with regularly lobed pinnae and anastomosing veins, allied to *L. davallioides,* but the leaflets much larger. There are two specimens from the Main Range in the Malay Peninsula which agree fairly well with the type of this Sumatran species, though they have rather smaller, often less regularly lobed, leaflets, and one has branched fronds. They are certainly distinct from the specimens referred to *L. davallioides*, and I provisionally refer them here, though it is possible that further collecting will indicate a distinction from the Sumatran species. This may be a case in which the mature plant is bipinnate, and it may be that the present simply pinnate collections are an immature state, not typical of the species. It is not safe in such a case to found a new species without ample material.

PAHANG: Fraser's Hill, 4000 ft., Holttum 11340.

PERAK: G. Kerbau, 4500 ft., Haniff 4023.

EXCLUDED SPECIES.

Lindsaya gracilis Bl.

I have seen several specimens of this species from Java. All agree closely together in having a long dark shining slender wiry rhizome, and narrow, rather deeply lobed, very oblique pinnae. So far as I know, nothing like these specimens has been found in the Peninsula. Ridley (1926, p. 22) refers a specimen from Bukit Tangga, Negri Sembilan, to *L. gracilis*. This specimen is at Kew, where I examined it, and noted that it appeared to be similar to the plants here referred to *L. Lobbiana.*

L. concinna J. Sm.

The type of this species (figured by Hooker, Spec. Fil., I, t.LXI B) is from the Philippines, and is quite distinct from any plants I have seen from the Peninsula. The specimens assigned by Ridley (1926), p. 21) to *L. concinna* are small simply pinnate forms of *L. orbiculata.*